THE *SPHAERODACTYLUS DECORATUS* COMPLEX IN THE WEST INDIES

by

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INTRODUCTION

On the Greater Antillean islands of Cuba and Hispaniola, and the Bahama Islands occur geckos of the genus *Sphaerodactylus* in which the juveniles are typically boldly marked with from two to five dark crossbands. Adults are sexually dichromatic—the females retain a modified and usually less intense juvenile pattern, and the males are either unicolor and patternless, or have large dark dots on a paler ground on the dorsum and head. The group was recently reviewed in part by Schwartz (1958). Inasmuch as additional material has been collected since that time and several new names applied to members of the group, it seemed appropriate to revise the complex completely. A large amount of the new material was collected in Cuba through the efforts of Major Chapman Grant, whose interest in these geckos resulted in his description of three new species of this (the *decoratus*) complex. Although there are still grossly inadequate numbers of these lizards from many areas of eastern Cuba, the material available indicates that a complete reassessment of the named forms and their interrelationships is in order. As will be seen, this strikingly marked group of geckos is considerably more complex than originally thought.

We collected *decoratus* group members in the Bahamas and Cuba. These specimens are in the Albert Schwartz Field Series (ASFS) and the collection of the senior author (RT). Other Cuban material collected by the junior author and John R. Feick, William H. Gehrmann, Jr., Ronald F. Klinikowski, David C. Leber, James D. Smallwood, and Barton L. Smith between the years 1957 and 1960 under the sponsorship of National Science Foundation grants G-3865 and G-6252, has been deposited in the American Museum of Natural History (AMNH). Messrs. Klinikowski and Leber were also students in the National Science Foundation Undergraduate Participation program during 1959 and 1960. We are indebted to Dennis R. Paulson and C. Rhea Warren for visiting Cat and Long islands in the Bahamas on our behalf, and to Miss Patricia A. Heinlein for assistance in collecting these geckos on South Bimini. The senior author visited the United States Naval Base at Guantánamo Bay, Cuba, through the cooperation of the U.S. Coast Guard and the officers and men of the U.S. Coast Guard cutter *Hollyhock*. We extend our sincere thanks to all of these people for their assistance and companionship in the field; without their efforts far less material would be available for our use.

In addition to our own material we borrowed material from the following collections whose respective curators and their assistants were most cooperative in lending us pertinent specimens: American Museum of Natural History (AMNH), Charles M. Bogert and George W. Foley; Academy of Natural Sciences of Philadelphia (ANSP), James N. Böhlke and Edmond V. Malnate; Brigham Young University (BYU), Wilmer W. Tanner; Carnegie Museum (CM), Neil D. Richmond and Clarence J. McCoy; Chicago Natural History Museum (CNHM); Robert W. Inger and Hymen Marx; Museum of Comparative Zoology (MCZ), Ernest E. Williams; University of Illinois Museum of Natural History (UIMNH), Hobart M. Smith; Museum of Zoology, University of Michigan (UMMZ), Charles F. Walker and Dale L. Hoyt; United States National Museum (USNM), Doris M. Cochran and James A. Peters; Yale Peabody Museum (YPM), Charles A. Reed. Attention is also directed to the collections made by George B. Rabb while on the Van Voast-American Museum of Natural History Bahama Islands Expedition between December, 1952 and May, 1953. These lizards, presently divided between the American Museum and the University of Michigan, are of special interest and add significantly to the quantity and quality of the available Bahaman material.

Most of the illustrations are the work of Wayne King. His attention to detail aided greatly in visualization of the various forms involved, and we thank him for his excellent delineations.

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HISTORICAL SUMMARY

The names applied to members of the *decoratus* group and their type localities are the following:

(1) *decoratus* Garman, 1888 - Rum Cay, Bahama Islands

(2) *flavicaudus* Barbour, 1904 - Mangrove Cay, Andros Island, Bahama Islands

(3) *torrei* Barbour, 1914 - Santiago de Cuba, Oriente Province, Cuba

(4) *gibbus* Barbour, 1921 - Stocky Island, Exuma Cays, Bahama Islands

(5) *stejnegeri* Cochran, 1931 - St. Michel de l'Atalaye, Dépt. de l'Artibonite, Haiti

(6) *drapetiscus* Schwartz, 1958 - 2 miles east of Playa de Guanabo, Cueva de Rincón de Guanabo, Habana Province, Cuba

(7) *spielmani* Grant, 1958 - Guantánamo, Oriente Province, Cuba

(8) *alayoi* Grant, 1959 - United States Naval Base, Guantánamo, Oriente Province, Cuba

(9) *ruibali* Grant, 1959 - United States Naval Base, Guantánamo, Oriente Province, Cuba

We examined the holotypes and syntypes of all the above forms. A total of 762 specimens of this complex was at our disposal.

All of the names listed above were proposed as full species with the exception of *drapetiscus*. Barbour (1921:227-228) considered *flavicaudus* a synonym of *decoratus;* the former name was based upon a series of fourteen syntypes, all males and without pattern. Barbour indicated that in *decoratus*, males were patternless and females were transversely crossbarred, a condition which had heretofore gone unnoted. In the same publication, Barbour (*op. cit.*:228-229) described *S. gibbus*, based on two specimens from Stocky Island and one from a cay off Roseville, Great Exuma. This species was diagnosed as being "coarsely spotted with large dots"; the holotype is a male. One of the paratypes (MCZ 13437) is barely spotted dorsally.

The name *torrei* was based upon two females and one juvenile (holotype and two paratypes); all are prominently crossbanded. Later, Barbour (1921:230-231) noted that male *torrei* are "uniform gray-brown or very faintly barred." However, Barbour commented under the discussion of *gibbus* that two Cuban specimens (one from Santiago de Cuba, the other from Guantánamo) were spotted like *gibbus*, but in habit and squamation were like *torrei*. Even at this early date in the history of the *decoratus* group, confusion was existent.

Hecht (1954:133) first suggested that *decoratus* and *gibbus* were conspecific. This course of action was followed by Schwartz (1958), who also considered *torrei* conspecific with *decoratus* and described *drapetiscus* as a subspecies of *decoratus*. Grant (1956:247-248) had previously discussed the status of *gibbus* (which had been reported from Cuba on the basis of spotted males), and stated that Cuban specimens of "*gibbus*" were in actuality spotted male *torrei*. Thus, the distribution of *torrei* was extended to those Bahaman islands where spotted males (=*gibbus*) occur.

To complicate the situation further, Grant (1958, 1959a and b) named three species (*spielmani, alayoi, ruibali*) from Guantánamo and the United States Naval Base at the Bahía de Guantánamo. Since *torrei* had already been recorded from this area (at Boquerón by Cochran, 1934: 12), the interrelationships of these four species was at once questioned. Such an abundance of similar species in one restricted area was not only unusual, but somewhat suspicious. Since Grant had not examined previously reported Oriente material, it was imperative that all these specimens be restudied to ascertain their status.

From this brief historical summary, it is obvious that the status of at least the Cuban members of the complex—and in part their Bahaman relatives—has been confused. This is due to three major factors: (1) the relative paucity of specimens from many regions (a condition which still persists); (2) lack of centralized source for materials (no one has ever assembled all available material together at once); and (3) the inherent complexity of dealing with a number of sympatric (or even syntopic) forms, all of which are sexually dichromatic and some of which apparently have trenchant pattern changes in males. It speaks highly for the perspicacity of Major Grant that he was able to discern differences between lizards where others had failed. Had he examined in detail specimens other than his own, the *decoratus* complex would likely be better understood.

PROCEDURES AND TERMINOLOGY

We used the method of counting body scales first proposed by Grant (1937:507) but first used consistently and further elaborated upon by King (1962). Dorsal scales are counted dorsolaterally on a line from axilla to groin; ventrals are counted in the midline from the level of the axilla to that of the groin; and a count is taken around the midbody. Internasal scales are the small scales between the enlarged nasals which border the rostral posteriorly. Otherwise the counts taken are standard or self-explanatory.

The group of geckos dealt with here generally has been considered to have granular scales in contrast to some other forms which have flattened and imbricate scales. Although the two extremes are quite different, there is no true dichotomy, and transitions from one to the other can be found. Thus none of the forms considered can be said to have simply granular dorsal body scales (such as are found on the head) which are juxtaposed and not imbricate. All forms show a tendency toward imbrication, even where no actual overlap of adjacent scales occurs.

We used the following terms (in part after King, 1962) to categorize the types of dorsal scales. Scales may be *imbricate* or *granular* (simple granular scales are not typical of any of the forms in this assemblage, but those scales which show a distinct separation from adjacent ones are so called). Granular scales, as here used, have the posterior edge somewhat raised (true nondirectional granules, when present, are usually the result of injury). They may be *swollen* or *flattened*, or they may be *erected* or *flat-lying*. Erected scales must in some degree be swollen; but if scales are strongly erected, somewhat swollen but still flattened, imbricate, and close packed (*serried*), the term *papillate* is used. Extremely erected granular scales are termed *conical*. In outline (*i.e.*, viewed normal to the plane of the scale), scales are categorized as *rounded*, *acute*, or *obtuse*. Scales may be *smooth* or *keeled*, although keeling in the group is usually very weak and when present may not be evident on all of the dorsal scales.

Various categories of scales may be found on a single individual. For instance, the more granular scales are usually found in the middorsal zone, while on the sides they tend to be more imbricate and erected. Nevertheless, there are distinct trends in some forms on which certain categories of scales occur over a greater surface of the body and with greater frequency than on other forms.

The *decoratus* group of *Sphaerodactylus* is characterized by

(1) Large size

(2) Sexual dichromatism

(3) Ontogenetic pattern changes in both sexes (greater in males)

(4) Banded patterns (basically), *i.e.*, females and juveniles

(5) Basically granular dorsal scales (with nonabsolute trends in the various species toward flattening, imbrication, keeling, or swelling and erection)

(6) Large compact escutcheons with little or no extension onto thighs

(7) Few large hair-bearing scale organs around the apex of dorsal body scales

Sphaerodactylus ruibali differs in some of these requisites, but we include it as a peripheral member of the *decoratus* group because of its apparent relationship to *intermedius*. *Sphaerodactylus cinereus*, a large, granular-scaled form, is not included in the *decoratus* group because of strong differences in the pattern (although the basic juvenile pattern is banded), scalation, and ungual sheath. *Sphaerodactylus cinereus* may be a peripheral member of this group, but its relationships are not obviously with the forms here included, and it does not demand discussion for that reason.

The sequence in which we discussed the forms in this study is not intended to be phylogenetic. Rather, we started with *decoratus*, which, as the oldest named and most widespread geographically, makes an ideal starting point. Thereafter, the forms are associated roughly according to relationships as we see them—insofar as can be done in a linear sequence.

THE BAHAMAN SITUATION

The Bahama Islands are for the most part clustered in loose associations on shallow banks. Slight changes in sea level would cause profound changes in the land exposure of this archipelago. The Bahamas are presumed to have been completely or nearly completely submerged during the Pliocene and Pleistocene (Rabb and Hayden, 1957:8). The relatively slight changes in sea level necessary to produce alterations in the land area plus the probable effect of current erosion in enlarging channels (Clench, 1938:485) may well mean that proximal parts of adjacent islands have been only recently separated. These parts may show closer faunal affinities than parts of a presently continuous land mass which may have been united recently after having been separated for a long period. For instance, the geckos of the south tip of Eleuthera are more similar to those of Cat Island than to those of the rest of Eleuthera. Both of these islands are now separated by a substantial water gap but connected by a shallow strip (Clench, 1938) which may indicate that their association has been closer in the past. Also, it appears that islands may bear intermediate populations which have only recently become isolated, and so while not true intergrades, they still have the characteristics of the original intergradient populations.

Sphaerodactylus decoratus Garman

Sphaerodactylus decoratus Garman, 1888, Bull. Essex. Inst., 20:111. Type locality, Rum Cay, Bahama Islands; type specimen MCZ 6220.

Definition. Dorsal scales granular to swollen, rounded to acute and slightly imbricate; sometimes with conical or papillate scales, especially on posterior flanks; faint keeling present (in some specimens only in a small area, usually the lumbar region) in majority of specimens; large hair-bearing organs (three hairs) present on posterior face of scales; dorsals, axilla to groin, 46-69; ventral scales (including those of throat and chest) smooth, flattened, acute to rounded and imbricate (axilla to groin, 29-46); midbody scales 61-89; dorsal scales of tail smooth, flatlying, imbricate and rounded to obtuse; scales beneath tail smooth, rounded, imbricate and enlarged midventrally. Internasals 0 to 4, mode 1 or 2; upper labials to mid-eye 3 to 5, mode 4; escutcheon large, compact, roughly triangular and with virtually no extensions onto thighs (5-10 X 6-23. Habitus stout; snout moderate in length and width; size moderate to large (to 40 mm snout-vent).

Female coloration: Dorsal ground color light (tan, gray, gray-brown); dark crossbands (3 to 5, axilla to groin; 5 to 7, snout to groin) some shade of darker brown with black edges; ocelli in bands white, with or without darker edges. Dark facial coloration extends to level just posterior to eyes; light areas on snout delimit loreal dark stripe and median snout stripe which forks posteriorly; narrow light band just behind facial markings followed by wide dark head band with ear situated about midway of its width. Dark neck band with two prominent paramedian light ocelli. Venters off-white to gray; dorsal markings extend onto venter in chin and throat region, usually becoming scrambled medially, forming a marbled pattern or fading out centrally. Juvenile coloration is like that of female but markings are more solid and contrasting.

Male coloration: (1) Unicolor dark to yellowish brown to bluish gray, tail and head more yellow, or (2) as just described but with pattern of scattered black or dark brown spots.

Range. Eastern Cuba from central Camagüey east, and the Bahamas north of the Crooked Island Passage (except San Salvador and unreported from many smaller islets) and excluding the Little Bahama Bank (Fig. 1).

Remarks. The dichromatism and particularly the variation in the males has caused considerable confusion. On the basis of spotted males from the Bahamas, Barbour (1921) named *S. gibbus* and later recorded it from Cuba. Grant (1956, 1959a) showed that *S. decoratus* was sexually dichromatic and interpreted the spotted pattern on males to be a transitory ontogenetic character. The juvenile pattern was thought to give way to the spotted which in turn was lost in older unicolor males. This sequence was presumed to have been demonstrated in a photograph (Grant, 1956: Fig. 1) of 12 males from the Banes area showing various degrees of spotting or its lack. We examined over 100 specimens from northern Oriente, most of them taken by Grant, and all males are spotted or are becoming so with the exception of a single series of 15 specimens that contains five unspotted males. We have reason to doubt the data for this series (see below). To us the evidence indicates that the degree of spotting is constant in the individual male after maturity, and its incidence in a population is constant and often geographically

circumscribed. In some populations males vary from completely spotted to completely unspotted, but in others either spotting or its lack is the predominant or exclusive condition. Bahaman populations exist in which the preponderance of spotted or unspotted males has remained constant in repeated collections over the past half-century.

In commenting on the specific distinctiveness of *drapetiscus* (=*intermedius*, *vide infra*) Grant (1959a) stated that the number of body bands is "fixed in each group" (presumably he meant species). On the basis of our broader survey of the group, we find this not to be so; band number, although constant in some species, is variable within single populations of some forms.

Sphaerodactylus decoratus decoratus
Garman

Sphaerodactylus gibbus Barbour, 1921, Mem. Mus. Comp. Zool., 47:228.

Definition. A race of *S. decoratus* characterized by moderate size; 3 or 4 bands (modally 4) between axilla and groin in females; bands relatively light, not heavy and dark, bordered posteriorly by light punctulations; ocelli lacking on body bands or present but small on the first band; throats faintly marked or not at all, and collar not prominently cleft middorsally; males spotted.

Range. The Exuma chain from Warderick Wells Cay south, Long Island, the Ragged Islands (known only from Great Ragged), and Rum Cay (Fig. 1). Records are not continuous

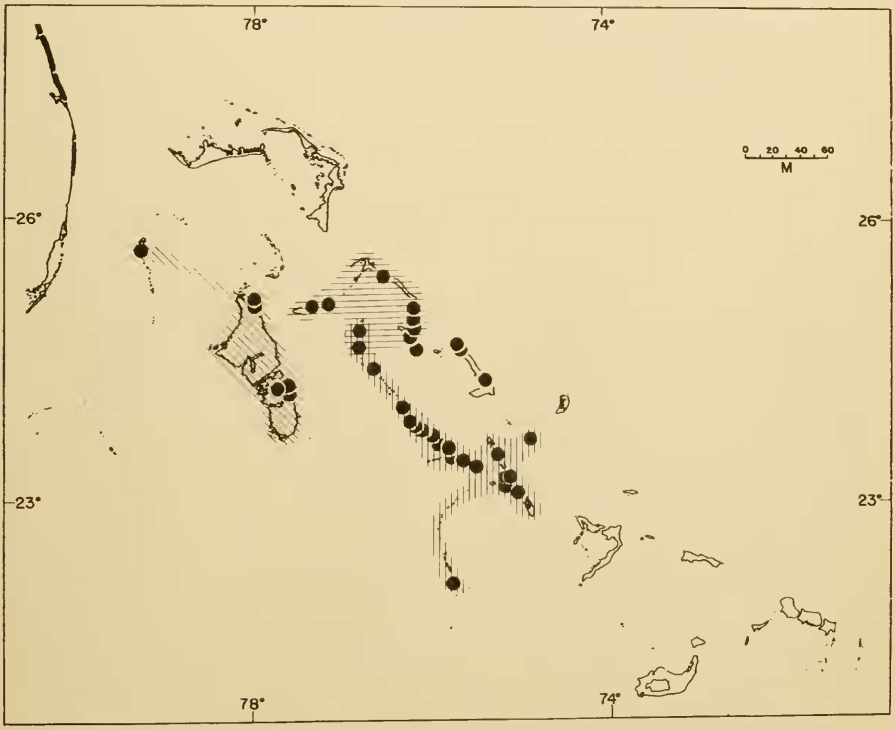


Fig. 1. Map of the Bahama Islands. Solid symbols indicate localities whence specimens of *Sphaerodactylus decoratus* have been examined. Ranges of subspecies are as follows: *S. d. decoratus*, vertical lines; *S. d. flavicaudus*, diagonal lines; *S. d. atessares*, horizontal lines. Overlap of symbols in the northern Exuma Cays indicates area of *atessares* influence on *S. d. decoratus*. Cat Island and the southernmost locality symbol on Eleuthera Island remain unshaded (see text for discussion).

(see specimens examined) and much of this range is presumptive. Also, the range is somewhat arbitrarily defined in the Exumas (see remarks below).

Variation. In 61 specimens, dorsal scales, axilla to groin, are 48-67, mean 59.0; ventrals, axilla to groin, 31-46, mean 37.1; midbody scales 67-86, mean 76.1. Internasals 1-4, mode 1 (Exumas) or 2 (Long); upper labials to mid-eye 3, 4 (mode) or 5. The largest male is 34 mm snout-vent, the largest female 37 mm snout-vent. Escutcheons compact with little extension onto thighs, range 6-8 X 7-13.

Female coloration (Fig. 2): Dark bands between axilla and groin 3 (11 specimens), 3/4 (4 specimens), 4 (37 specimens). Bands are typically light (brown to gray brown), minutely flecked with light, with a narrow black edge, and a border of buffy spots along the posterior edge; ocelli are white and minute when present (seldom); ground color light gray to tan. Collars typically darker than body bands; a few specimens show some middorsal splitting of collar; ocelli white and small, not always present. Tails banded with light gray to white and black. Throats faintly marbled in few specimens but usually lack markings. Males tan to brown or light gray, with a well-developed pattern of black spots (Fig. 3), a few specimens at the extremes of variation have only sparse spotting; one specimen from Big Farmers Cay lacks spots; ground color of head dull yellow, tail usually brighter. Iris color rich brown. (Colors given are from notes taken on Great Exuma specimens.)

Aberrant head pattern variants, in which the facial band is joined to the head band by two dorsolateral bridges of dark pigment or in which the light interband between these two elements has a pair of dorsolateral diverticula into the head band, occur in a high percentage of Long Island specimens. These variants are found more rarely elsewhere, and one occurs in the single specimen from Great Ragged.

Remarks. The exact limits of the range of this subspecies cannot be presently given. We have rather arbitrarily defined the northern limit in the Exuma chain. Specimens from the upper Exumas, particularly Leaf Cay, we believe to show the influence of the Eleuthera race in that they have only three body bands, modally two internasals, and the only male is unspotted. However, since the shift in internasal modality actually occurs much further down the chain, it is possible that the transition is more gradual or that various populations on the Exuma Cays have diverged independently to some extent. The Rag-

Figs. 2-5. Fig. 2. *Sphaerodactylus decoratus decoratus*, female, dorsal view; ASFS V7008, 0.8 mi NW George Town, Great Exuma Island, Bahamas. Fig. 3. *S. d. decoratus*, male, dorsal view; ASFS V7070, 9.8 mi NW George Town, Great Exuma Island, Bahamas. Fig. 4. *S. decoratus* subsp., female, dorsal view; MCZ 39554, Arthur's Town, Cat Island, Bahamas. Fig. 5. *S. d. atessares*, female, dorsal view; MCZ 81100, holotype, 4 mi N, 2.3 mi E Rock Sound, Eleuthera Island, Bahamas.

ged Islands are included on the basis of only one specimen from Great Ragged at the southern end of the chain; it agrees with S. *d. decoratus* as presently defined, but obviously nothing can be said about variation in the Raggeds. Long shows some divergence from the Exuma populations in internasal modality and coloration (splitting of the collar); it shows some influence of the rather divergent Cat Island population, which is not subspecifically allocated herein. We have called this cluster of populations *decoratus* because the single juvenile type from Rum Cay, which is geographically close, falls within the variation of these populations as far as can be determined. Should the Rum Cay population be found to be distinct, *gibbus* Barbour will be the next available name for those populations we are calling S. *d. decoratus*.

Specimens examined: Exuma Cays: Warderick Wells Cay, AMNH 76237; Great Guana Cay, CM 41046, 41058; Big Farmers Cay, AMNH 76232-36 (12 specimens), CM 41019-20; Cave Cay, CM 41022; Darby Island, UMMZ 117017-18 (8 specimens); **Great Exuma:** 9.8 mi NW George Town, ASFS V6978-81, V7070-75; approx. 2 mi SE Rolle Town, ASFS V6987-92; 0.8 mi NW George Town, ASFS V7001-09; 3.2 mi NW George Town, ASFS V7012-14, RT 1387; approx. 4 mi NW George Town, ASFS V7020; 1.0 mi SE Moss Town, ASFS V7095; Stocky (Stocking?) Island, MCZ 13436 (type of *gibbus*), 13437 (paratype); cay off Roseville (Rolleville?), MCZ 13435 (paratype); **Little Exuma:** 5.7 mi SE The Ferry, ASFS V7045-50; Hog Cay, MCZ 55620; **Long Island:** MCZ 37957; Simms, CNHM 22744-47, MCZ 42278-79, 84396; Grays Settlement, ASFS V6812; 2 mi E Grays Settlement, ASFS V8613-28; Deadman's Settlement, UMMZ 117020; Clarence Town, MCZ 42280-81, UMMZ 117019 (2 specimens); **Rum Cay:** MCZ 6220 (type of *decoratus*); **Great Ragged Island:** UMMZ 118029.

The population of S. *decoratus* on Cat Island shows certain peculiarities of its own. Most notable is the greater degree of middorsal splitting of the collar (Fig. 4); this appears to be ontogenetic, and the majority of adult females show nearly complete division of the collar, which is a greater incidence than found in other populations of the species (the Bahaman races are the only ones in which the trend is present). Some specimens from Long Island and the Exumas show a trend in this direction, with that of Long being strongest. More complete collections may show a definable population to exist on Cat and the proximal northwestern end of Long (in the present sample greater splitting of the neck band appears to occur in the north). Of the six Cat Island males four are unspotted and two have some indication of spotting. This also suggests some divergence from the bulk of the material assigned to S. *d. decoratus*, but it is not conclusive. Body bands are 3/4 in 3 specimens, 4 in 20 specimens, and 4/5 in 2 specimens. This is a trend toward higher numbers of bands than is found in the other races. For the Cat Island specimens dorsals are 49-64, mean 54.8; ventrals 35-46, mean 40.1; midbody scales 70-85, mean 76.5; fourth toe lamellae 7-13, mode 10; internasals 1-4, mode 1; escutcheons 5-9 X 7-11.

Sphaerodactylus decoratus flavicaudus Barbour

Sphaerodactylus flavicaudus Barbour, 1904, Bull. Mus. Comp. Zool., 46:56. Type locality, Mangrove Cay, Andros Island; cotypes, MCZ 84385-95, 6953, 13564, UMMZ 107614.

Definition. A moderately sized race of *decoratus* characterized by 3 or 4 body bands, relatively light, not heavy and dark, bordered posteriorly by light punctulations; throats of females moderately to slightly marked; collar not prominently cleft middorsally; males unspotted.

Range. Known from the islands of Andros and South Bimini (Fig. 1); may be reasonably expected on the rest of the Bimini chain with the possible exception of North Bimini.

Variation. In 60 specimens, dorsals range from 46-66, mean 56.1; ventrals 31-42, mean 36.9; midbody scales 61-86, mean 73.6; fourth toe lamellae 8-13, mode 10; internasals 1-2, mode 1; upper labials 3-5, mode 4; escutcheon 6-8 X 7-13. Largest male and female 35 mm snout-vent.

Female coloration: Ground color gray to tannish-gray; bands wood brown with narrow, dark, not sharply distinct edges and bordered posteriorly by light flecks. Body bands 3 (8 specimens), 3/4 (13 specimens), or 4 (34 specimens). Collar black in juveniles, dark brown in adults with white ocelli, middorsal break lacking or not prominent. Ocelli of moderate size and prominence, sometimes present on first body band. A distinct but not boldly contrasting throat pattern is present in a few females, but in most the markings are faint or virtually lacking.

Male coloration: Dull brown; head, throat and tail pale yellow. None of the extensive series

of males of this form is spotted. Iris color in Bimini specimens was noted as "greenish-gray to silvery." (All above colors are from field notes on South Bimini specimens.)

Comparisons. *Sphaerodactylus d. flavicaudus* differs from *decoratus* primarily in having unspotted males. In scale characters there are no significant differences, except in the number of fourth toe lamellae which is modally 10 in *flavicaudus* and 12 in *decoratus*. The frequencies for the different categories of body banding are about the same in both. Female *flavicaudus* tend to have more prominent throat markings, but there is considerable overlap. On the basis of the Bimini material there appears to be an iris color difference, that of *flavicaudus* greenish gray to silvery and that of *decoratus* (Great Exuma) rich brown.

Specimens examined. "Bimini," AMNH 73489, 73493-96; South Bimini: western side, ASFS X4663-69, AMNH 76873, 68806 (2 specimens), 68807 (2 specimens), 68808 (2 specimens); western end, ASFS X4733-39, X4753-60, X4780-81, CM 34133; Andros: MCZ 6221, 84369; approx. 0.5 mi N of Nicholl's Town, ASFS V6966-71; west side Morgans Bluff, ASFS V6974-75; Mangrove Cay: MCZ 6952, 84375-84, 84385-95 (cotypes), 6953 (cotype), 13564 (cotype), UMMZ 107614 (cotype), AMNH 24715; Bastian Pt. on South Bight, UMMZ 117022; Pinder Village (not mapped), UMMZ 118028 (2 specimens); South Bight, Driggs Hill shore, UMMZ 117023 (2 specimens).

Sphaerodactylus decoratus atessares[1], new subspecies

Holotype. MCZ 81100, an adult female from 4 mi N, 2.3 mi E Rock Sound, Eleuthera, Bahama Islands, collected 5 October 1965 by Richard Thomas.

Paratypes. Bahama Islands, Eleuthera: ASFS 17557, Alicetown, native, 6 November 1961; AMNH 69245-46, 69249, Hatchet Bay, G. Campbell, 5 April - 17 July 1948; ASFS V6805-06, 6 mi N Tarpum Bay, R. Thomas, 3 October 1965; ASFS V6833-40, V 6842-54, same data as type; USNM 157895-902, MCZ 81101-09, same locality and collector as type, 7 October 1965; UF 21504-09, UIMNH 61651-58, CM 40586-90, ASFS V6946-53, same locality and collector as type, 9 October 1965; KU 93349-51, 1.5 mi E, 2.9 mi S Rock Sound, R. Thomas, 7 October 1965; KU 93348, 5 mi NNW Southeast Point, R. Thomas, 4 October 1965.

Associated specimens. New Providence: MCZ 6973; UMMZ 100741, Nassau, Ft. Charlotte; Rose Island: (near New Providence), UMMZ 117021.

Diagnosis. The largest subspecies of *decoratus*, characterized by possessing only three body bands, which are nearly solidly pigmented, have only a narrow light central zone, and are edged posteriorly by continuous narrow light areas instead of discrete punctulations; bands in juveniles solid, not lightened by faint light stippling.

Range. The island of Eleuthera, excluding the southern tip (Fig. 1); there are no specimens from north of Hatchet Bay; also New Providence and Rose Island, at least tentatively.

Description of type (Fig. 5). An adult female, 39 mm snout-vent length, total length 73 mm; dorsal scales, axilla to groin, 63; ventrals 37; midbody scales 77; 10 fourth toe lamellae; four labials to mid-eye on either side; two internasals. Median dark snout stripe present, slightly forked posteriorly, joins dark interocular area at level of posterior part of eyelid; head band black, slightly lightened centrally; collar nearly solid black with no median interuption, ocelli small, white; three body bands with wide dark margins and narrow, indistinct central light area; light outlines to dark bands give appearance of accessory indistinct dark bands in middle of interband areas. Faint small ocelli present on all body bands. Tail alternately banded with black and white; throat markings indistinct; venter light grayish.

Variation. In 60 paratypes dorsal scales range from 50-69, mean 58.6; ventrals 34-44, mean 37.9; midbody scales 64-88, mean 76.0; fourth toe lamellae 8-14, mode 10; internasals 1-3, mode 2; escutcheons compact as in the rest of the species, 5-9 scales long and 6-13 wide.

Female coloration: Most female paratypes are similar in color and pattern to the type. The most notable variant is a tendency toward fragmentation of the body pattern in some large specimens in which the dark areas are sharply set off, and the ground color lighter. Light flecks form a posterior border to the dark stripes instead of a continuous light edge in a few specimens, but the flecks are not so prominent and discrete as in other races. Small paired ocelli are found in all three body bands in about one-third of the specimens; others have ocelli in the first or second body band, and others in none. In life, females were noted as having a light gray to

[1] *atessares*, from Greek *a* (alpha privative = without, and *tessares*, four

gray-brown ground color, bands dark brown, variably hollowed with lighter brown; venters pinkish gray; tails banded black and white. Juveniles have the female coloration but the bands are solid except for the occasional presence of the minute paired ocelli, and the interbands are lighter, almost white, sometimes with a pinkish tinge, and with no central darkening; transition to adult coloration is gradual.

Male coloration: Males vary from completely unspotted to completely spotted; the ground color is brown to gray brown or light gray, with the heads dull yellow and tails usually somewhat brighter yellow. Iris color for specimens of *atessares* was noted as brown.

Comparisons. In possessing only three body bands *atessares* differs in a strongly modal manner from all other Bahaman races. The heavily pigmented body bands differ from those of the vast majority of specimens of the other races; the small, irregular and relatively sharply set off central light areas of the dark bands also differ from the more extensive light areas and narrower dark margins of the other forms. The collars of *atessares* show no tendency toward middorsal splitting as is found in at least some specimens of the other Bahaman forms, especially in the Cat Island population.

The discrete light flecks that form the posterior margins of the dark bands in the other Bahaman populations do not characterize *atessares.* Even where there is some indication of punctulations, the light border is more continuous and the flecks not so prominent as in the other subspecies. The solid banding and contrasting ground color of the juvenile *atessares* apparently is a constant difference, as the dark bands of the juveniles of the other Bahaman populations are stippled with light areas, and result in a hazier, less substantial appearance to the pattern. Although male *atessares* may be thoroughly covered with spots, they never seem to attain the neatness and regularity found in some spotted males of *decoratus. Sphaerodactylus d. atessares* exceeds all other members of the species in size, the maximum snout-vent length being 40 mm (six specimens). The maximum size for the other races varies but does not exceed 37 mm. The impression received when collecting the paratypes was that they were distinctly larger than other members of the species which had been collected. In scalation the differences are slight; the modal internasal condition of 2 differs from other races discussed except for the Long Island population of *decoratus*; the modal fourth toe lamellar count of 10 differs from that of *decoratus* (12) but not from *flavicadus.*

Eleven freshly collected geckos from the southern tip of Eleuthera (Southeast Point) are not assignable to *atessares.* The two males are unspotted and very pallid. Of the remaining specimens, three have four body bands, two have four bands on one side, and three have three bands. All (except the males) show the lighter body bands bordered posteriorly by light flecks which are not characteristic of *atessares.* The one adult female has a nearly completely divided collar. It is our belief that these specimens show the influence (apparently strong) of the Cat Island geckos immediately to the south.

Two specimens from New Providence and one from Rose Island near New Providence are provisionally referred to *atessares.* One of the New Providence specimens has three heavy dark body bands, the other is a juvenile in poor condition which has four bands. Little else can be determined. The Rose Island specimen has three bands but is not typical of *atessares* in all ways. Only additional material from these islands will show their true affinities.

Six specimens from Leaf Cay and one from Little Norman's Cay in the Upper Exuma chain (which closely approaches Eleuthera) may show the influence of *atessares.* They have three body bands and two internasals, and the one male is unspotted. Otherwise they bear no particularly close resemblance to *atessares.* They likely are the result of past genetic continuity with the Eleuthera race, and the resultant influence may extend some distance down the Exuma chain (see remarks under *S. d. decoratus*).

THE CUBAN SITUATION

Unfortunately for systematists, the city of Guantánamo in Oriente Province has the same name as the extensive bay to the south, which has in turn bestowed its name upon the United States Naval Base located at the mouth of the bay. The city is situated well inland (about 18 miles), nearly in the foothills of the Sierra del Guaso which here forms the southern margin of the mountainous interior of the province. To the south and slightly to the east of the city lies

the bay, extending about 13 miles inland in a north-northeasterly direction, and at its entrance occupying *both sides* is the U. S. naval base (although the main part of the Base is on the east side of the bay). The naval base, then, is at best (straight line distance) about 13 miles from the city, and such a path would necessitate cutting across the bay itself. Thus the naval base is a substantial distance from the city, and its principal part is on the opposite side of a very significant physical barrier.

To add to the general uncertainty of most herpetological collections from the region, in which people have in the past failed to distinguish a city from its surrounding countryside, we find that some (and fear that others) have not distinguished between the city, the bay, and the naval base bearing the name Guantánamo. For example, the type locality of *Sphaerodactylus alayoi*, as stated in the original description, is the naval base but the locality of the holotype as catalogued is "Guantánamo." There appears to be no simple way of determining the truth of the matter, for collections apparently were made by Grant at both the naval base and the city (*e.g.*, the type locality of *spielmani*, *fide* the original description is "Guantánamo"). To confuse matters further, virtually no collectors have made any effort to specify where on the naval base specimens were collected—an elemental consideration for anyone hoping to further scientific knowledge. It is probable that most collections labelled "U. S. Naval Base, Guantanamo Bay," or some such, came from the eastern side of the bay, but then one can never be sure. In situations such as we face in the present study, it would be most helpful to be certain. In conclusion, knowledge of the complex (and we do indeed mean complex) of sphaerodactyls occurring in the vicinity of Guantánamo must remain to a certain degree in confusion. Our results in some instances are tentative, and in such cases we will make ready reference to the state of affairs.

Barbour (1914) applied the first name to this complex of banded Cuban forms when he named *torrei*. His description of the type said that it had five dark transverse bands from snout to sacrum. Additionally, and perhaps most pertinent, he never figured the type but only other specimens that he presumed to pertain to this form. Thus, when Grant (1958) described *spielmani* he assumed the name *torrei* to apply to a three-banded (between axilla and groin, six from snout to groin) form as illustrated by Barbour (1921). Unfortunately the assumption was incorrect, the type and paratypes of *torrei* have two bands between the axilla and groin and pertain to the form to which Grant assigned the name *spielmani*. Thus *spielmani* is a junior synonym of *torrei*. With the more widespread three-banded form of Cuba we associate the name *S. decoratus*.

Sphaerodactylus decoratus granti, new subspecies

Holotype. BYU 17233, an adult female, collected at Banes, Oriente Province, Cuba, by Chapman Grant, January, 1958.

Paratypes. Cuba: Camagüey Province: MCZ 57339-43, 7 km S Playa Santa Lucía, R. Molina and R. Ruibal, 9 July 1957; MCZ 59316, 15 km S Playa Santa Lucía, R. Molina, E. E. Williams, R. Ruibal, 24 August 1959; Oriente Province: MCZ 36941-42, Las Calabazas, Holguín, S. Aguayo, 4 June 1923; BYU 17192-232, 17234-17268, 22889-22920, and two untagged juveniles, same data as type; AMNH 61404-10, Marcané, C. M. Jervis, 30 January 1930.

Definition. A race of *S. decoratus* characterized by moderate size, three uniformly colored, brown body bands with sharp dark edges and with prominent, dark-edged paired ocelli usually on each band; bands not prominently edged with light or with posterior light flecks; collar not black but colored like body bands; throats prominently marbled in the majority of specimens; males spotted.

Range. Presently known from extreme northeastern Camagüey Province, the northern half of Oriente Province whence it is presumed to follow areas of low or intermediate elevation around the western edge of the central Oriente mountains (Sierra de Nipe and its southern affiliates) to the vicinity of the city of Guantánamo (Fig. 6).

Description of type (Fig. 7). An adult female, 27 mm snout-vent, 51 mm total length; dorsals, axilla to groin, 51; ventrals 37; midbody scales 81; fourth toe lamellae 12, upper labials 4/4, one internasal. Coloration: Head, neck and three body bands brown with distinct dark edges; prominent dark-edged, paired, cream-colored ocelli present on neck band, and present but less prominent on 3 body bands; snout stripe complete, forked posteriorly, fading into dark interocular area; head coloration extending onto underside of head with band edges retaining their alignment but mixing centrally, resulting

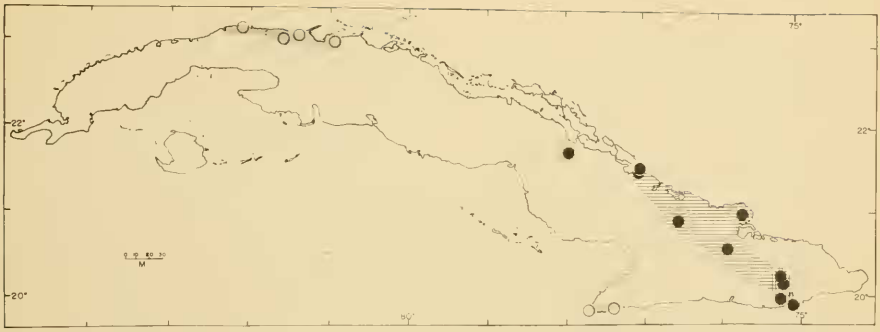


Fig. 6. Map of Cuba. Solid symbols indicate locality records for *Sphaerodactylus decoratus,* hollow symbols for *S. intermedius.* Ranges of subspecies of *S. decoratus* are as follows: *S. d. granti,* horizontal lines; *S. d. lissodesmus,* diagonal lines; *S. d. strategus,* vertical lines. Overlap of symbols of *granti* and *strategus* in the vicinity of Guantánamo indicates area of intergradation.

in prominent brown on cream marbling; ground color of body tan to pale, nearly cream; body bands narrowly outlined in light; tail banded with alternating dark-edged brown bands and tan interbands; venter cream, faintly stippled with dark pigment.

Variation. Of the 51 specimens counted dorsal scales are 47-66, mean 56.3; ventrals 29-41, mean 35.0; midbody scales 69-89, mean 78.1; fourth toe lamellae 7-13, mode 10 or 11; internasals 0-2, mode 1; escutcheons 5-10 X 8-17. The largest specimens of both sexes are 32 mm snout-vent.

Female coloration: The other female specimens are very similar to the type in coloration. There is some variation in intensity of the dark edges to the bands, and some have accessory dark spotting in the bands. Ocelli occur on the neck bands and all three body bands in over half of the specimens; in the rest of the ocelli usually occur as far posteriorly as the second body band. No adult specimen and few juveniles are without some indication of ocelli on at least the first two body bands. Throat patterns are prominent in all but a very few specimens, and in those they are indicated. As is typical of the species, juvenile patterns are more solid, and hatchlings appear banded black and white.

Male coloration: Adult males are spotted; spots vary in size, some large or distinctly smaller and more numerous; most are fully spotted dorsally, but a common variant is the lack of spotting on the head. Variation in degree of spotting includes a few which are sparsely spotted and five which have no spotting at all. These five are all part of a series (BYU 22927-41) which was catalogued at a later time than the balance of the specimens, and all of this series are badly dessicated. It is evident that their history has in some way been different from the other specimens. The incidence of unspotted individuals (5 out of 15) compared to no unspotted specimens among the other northern Oriente males (37 specimens) throws further doubt on these specimens. Additionally, the series in question immediately follows in the catalogue a series of six (BYU 22921-26) also much dessicated *S. notatus,* whose locality is given as Guantánamo. Thus, we regard this series of males supposedly from Banes with high suspicion and believe that their locality is probably Guantánamo.

Comparisons. From *decoratus* and *flavicaudus, granti* differs in having only three body bands (versus a mode of four), and in having the bands more distinctly dark edged and more regular in outline. In *granti* there is a lack of the hazy aspect of the pattern of these two Bahaman races and the punctulate posterior border to the body bands. The ocelli are more frequent and more prominent in *granti* and the collars are never solid black as they often are in all of the Bahaman races. The boldness of the throat pattern is also greater in *granti. Sphaerodactylus d. granti* is distinctly smaller than the Bahaman races but the contrast with *atessares* is most striking. In *atessares* there are heavily darkened margins to the body bands with smaller and irregular light centers as opposed to the wide, lighter bands with distinct narrow dark edges of *granti.*

Sphaerodactylus decoratus lissodesmus, new subspecies

Holotype. MCZ 57344, Sierra de Cubitas near Banao, Camaguey Province, Cuba, collected 22 August, 1957 by R. Molina and R. Ruibal.

Paratype. MCZ 57345, same data as type.

Definition. A race of *S. decoratus* characterized by having three light brown body bands with dark brown edges fading into the color of the band, not abruptly set off from it; ocelli indistinct or lacking, head band joined or approximated to dark facial area by two or three "bridges" of pigment near the dorsal midline; posterior light interband of the head distinctly wider than the central head band; snout region not heavily pigmented and extending onto underside of head along margin of lower jaw instead of to midline. Males unspotted.

Range. Known only from the Sierra de Cubitas in Camaguey Province, Cuba (Fig. 6).

Description of type (Fig. 8). An adult female 29 mm snout-vent; tail missing; dorsal scales, axilla to groin, 53; ventrals 33; midbody scales 84; fourth toe lamellae 11; upper labials 4/4, one internasal. Coloration. Ground color pale tan, three body bands brown, smooth edged and with narrow dark edges that fade gradually into wide central area of bands; collar with heavy dark edges that fade into a light center, and with one small, not dark-edged ocellus on the right side. Facial pattern much simplified: loreal and median snout stripes join in the midline at a level posterior to the eyes and form an elongate trident-like figure with a short posterior spire that nearly meets the dark head band, which in turn has two small anterior projections on either side of the spire; light interband on head and neck wider than dark head band; snout pattern not extending toward midline of underside of head but ending along the sides of the lower jaw.

Variation. The single paratype, a male, is attaining the unicolor phase; a faint pattern, much like that of the female, is yet evident; the trident-like cephalic figure is present, but the spire and the projections of the head band connect both elements instead of just approximating them. Dorsal scales, axilla to groin, 49; ventrals 36; midbody scales 79; fourth toe lamellae 12; labials 4/4; internasals 2; escutcheon evident but not fully developed; snout-vent length 30 mm.

[1]*lissodesmus*, from Greek *lisos*, smooth, and *desmos*, band

Figs. 7-10. Fig. 7. *Sphaerodactylus decoratus granti*, female, dorsal view; BYU 17233, holotype, Banes, Oriente Province, Cuba. Fig. 8. *S. d. lissodesmus*, female, dorsal view; MCZ 54344, holotype, Sierra de Cubitas near Banao, Camaguey Province, Cuba. Fig. 9. *S. d. strategus*, female, dorsal view; MCZ 81110, holotype, east side of the Bahia de Guantánamo, United States Naval Base, Oriente Province, Cuba. Fig. 10. *S. alayoi*, female, dorsal view, USNM 44219, paratype, U. S. Naval Base, Guantánamo, Oriente Province, Cuba.

Comparisons. Although only two specimens assignable to *lissodesmus* are available, they are so different from the other races of *decoratus* that we have little doubt that they represent a distinct form endemic to the limestone massif of the Sierra de Cubitas. The complex head pattern joining the facial markings and head band serve to distinguish *lissodesmus* from all other subspecies. The smooth-sided and distinctly colored body bands are not found, although rarely approached, in the other races. The slight extent of the facial pattern onto the throat is also distinctive and in contrast to the Bahaman specimens, which frequently have a very faded, virtually absent throat pattern. The single male is unspotted, and if this is true for the population, *lissodesmus* is additionally distinct from its nearest geographical relative *granti*, which has spotted males.

Sphaerodactylus decoratus strategus[4], new subspecies

Holotype. MCZ 81110, an adult female from the east side of the Bahía de Guantánamo, United States Naval Base, Oriente Province, Cuba, collected 24 April 1965, by Richard Thomas.

Paratypes. MCZ 81111, USNM 15903-04, ASFS V6244, V6246-47, same locality as type, 23 April 1965, R. Thomas, native; ASFS V6256-60, V6262, same data as type; ASFS V6275, same locality as type, 25 April 1965, R. Thomas; MCZ 68732, 69441, same locality as type, R. V. Lando, June 1962 and August 1958; UIMNH 44232, same locality as type, A. Spielman, January 1958.

Associated specimens. USNM 59221-31, Caimanera, Oriente Province, Cuba.

Definition. A race of *decoratus* closely allied to *granti* in possessing three wide body bands with narrow black margins, but differing from that form in that the males are unspotted.

Range. The south Oriente coast, possibly only that part to the east of the Bahía de Guantánamo (Fig. 6); presumed to intergrade with S. *d. granti* in the vicinity of the city of Guantánamo.

Description of type (Fig. 9). An adult female, 32 mm snout-vent, total length 60 mm. Dorsal scales, axilla to groin, 64; ventrals 42; midbody scales 84; fourth toe lamellae 11; upper labials 3/4; one internasal. Coloration: Three wide body bands bordered with a sharply distinct narrow dark margin; ocelli present on collar and indistinct on first two body bands; head band wide, only narrowly separated from collar and facial markings; snout stripe entire, forked posteriorly and connected with interocular dark area; head band continues across throat as do the facial markings; collar interrupted in midline of throat; tail banded with broad dark and narrow light bands. (For color in life see below.)

Variation. Dorsal scales, axilla to groin, 50-67, mean 59.1; ventrals 33-42, mean 36.8; midbody scales 73-84, mean 78.3; fourth toe lamellae 8-13, mode 11; escutcheons 7-10 X 8-23. Female coloration is much the same as that of the type; one specimen has a split body band on one side giving a 3/4 formula. Specimens were noted in life as having the dark bands dark brown or gray-brown, light interbands tan or light gray or gray-brown; ocelli white; venter gray, light bands on throat cream; light bands near tip of tail white. Iris color dark brown. Males were noted as having the dorsal coloration gray or blue-gray with faint lighter flecking evident, sometimes outlining the banded "female" pattern. Heads were dark dull yellow, tails yellow to dark yellow-green; venters light gray; throats and tails dull yellow beneath. Iris color gray to gray-brown.

Comparisons. The female coloration of this form is closest to that of *granti* on the north coast. There appears to be an at least average greater width of the body bands in *strategus*. Grant (1959a) commented that the south coast "*torrei*" (=*decoratus* as used herein) was lighter in color than those on the north coast. This is probably correct but cannot be verified in the preserved specimens. The specimens from the city of Guantánamo that are assignable to *decoratus* (see below, specimens not subspecifically allocated) are considered to be intergrades between *granti* and *strategus*, as they include both spotted and unspotted males. The associated specimens from Caimanera on the west side of the bay are only tentatively referred to *strategus* because of geographical proximity; there are no males in the series to allocate them definitely. Otherwise, the comparisons of *strategus* are for all practical purposes the same as those of *granti*.

The paucity of specimens of S. *decoratus* from the southern coast of Oriente is strange, and it is possible that the primary distribution of the species in this region is to the east of the

[4]*strategus*, from Greek: *strategos*, admiral

Bahia de Guantánamo. Although there are specimens from Caimanera on the west side of the bay, there is no evidence of the occurrence of *S. decoratus* any farther to the west. The only Grant specimen of *strategus* that we know of is one that was included in the type series of *S. alayoi*. The fact that Grant collected other forms but apparently not many *decoratus* on the Naval Base may indicate that he collected in a different ecological situation than that preferred by *decoratus*.

Specimens Not Allocated to Subspecies

Specimens examined but not subspecifically allocated. *S. decoratus*: **Bahamas: Exuma Cays,** Leaf Cay, AMNH 76238-43; Little Norman's Cay, MCZ 13478; Eleuthera, Southeast Point, ASFS V6812-17, V6818-22; **Cat Island:** Orange Creek, Arthur's Town, MCZ 39556-62; Orange Creek, 1.5 mi NW Arthur's Town, UMMZ 79444 (5), 79445 (4); Arthur's Town, MCZ 39546-55; The Bight, ASFS V2138-39. *S. decoratus granti* X *strategus*: **Cuba, Oriente Province:** Guantánamo, BYU 17183-91, ?22927-41, USNM 59004, 63218, MCZ 8508, 13482-83, UMMZ 90632; Guantánamo, Monte Libano, MCZ 14665.

Sphaerodactylus alayoi Grant

Sphaerodactylus alayoi Grant, 1959, Herpetologica, 15(1):49. Type locality, Guantánamo Naval Base, U.S.N., Oriente, Cuba; type specimen, UMMH 44215.

Definition (males have not been included in the computations for reasons that will become apparent). Dorsal scales swollen, granular to imbricate above, becoming erected and papillate on the posterior flanks; faint keeling present in adult specimens; dorsals, axilla to groin, 53-60, mean 55.8 (23 specimens); ventral scales smooth, flattened, rounded and imbricate, 32-39 axilla to groin, mean 35.9 (20 specimens); midbody scales 73-82, mean 76.4 (21 specimens); scales of tail acute to rounded, smooth, flattened, imbricate, enlarged in midventral line; fourth toe lamellae 6-11, mode 10; internasals 1-2, mode 1; upper labials to mid-eye 3-5, mode 4; escutcheon large, compact, roughly triangular and with no extension onto thighs (5-8 X 9-12); habitus stout, snout moderate in length and width; size moderate, to 32 mm snout-vent.

Female coloration (Fig. 10): Pattern banded with three bands between axilla and groin; dark body bands twice or only slightly more than twice the width of light (cream to tan) interbands; dark bands sharply demarcated with wide dark borders and relatively narrow light central portions, no dark spotting or dark-edged ocelli present, ocelli usually present in neck band, not prominently dark-edged, transversely elongate; ocelli seldom present in body bands, not conspicuous and not prominently dark-edged, and tending to be transversely elongate; neck and head bands generally darker and more solid than body bands; loreal and median snout stripes present, snout stripe joining interocular dark area; ventrally, head stripes (including dark area anterior to eyes) usually continue across throat; neck stripe interrupted, or with only anterior dark edge continuing across throat. Young have solid bands as in other members of this group. Males which are assigned to this form are becoming unicolor but have some banded pattern remnants; others show some degree of spotting.

Range. Reported only from the type locality (Fig. 11).

Remarks. The status of *S. alayoi* is more questionable to us than that of any of the other species. There is no doubt whatsoever that the female coloration of this lizard is eminently distinct from that of *S. decoratus* which it resembles most closely. Included in the type series was one

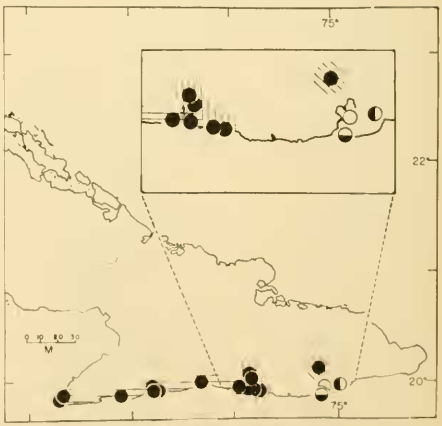


Fig. 11. Map of eastern Cuba with detailed inset of the region between the Bahia de Santiago and the Bahia de Guantánamo. Solid symbols indicate locality records for *Sphaerodactylus torrei*, hollow symbol for *S. alayoi*, vertically semisolid symbol for *S. ruibali*, horizontally semisolid symbol for *S. ruibali* + *S. alayoi*. Subspecies of *S. torrei* are as follows: *S. t. torrei*, vertical lines; *S. t. ocujal*, horizontal lines; *S. t. spielmani*, diagonal lines.

female (UIMNH 44232) which we consider to be a specimen of *decoratus* and not an *alayoi*. Males are less easily identifiable but remnant patterns do seem to ally them with the females. We have assigned two additional male specimens (MCZ 69438, 69440) to *alayoi* on the basis of their resemblance to the male paratypes.

It is possible that *alayoi* is a local pattern variant (it has been found nowhere else) or a very circumscribed race of *S. decoratus* in the region of the Bahía de Guantánamo (see Thomas and Schwartz, 1966, on *S. beattyi*). Obviously we are at a distinct disadvantage in dealing with *alayoi*, for we have not seen it in the field or in life. Unfortunately neither ecological information regarding the type series nor a statement of other species collected with the type series was given. We do not know if specimens of *decoratus* were found syntopically with *alayoi*, whether all specimens of *alayoi* were found together at one precise locality (the U.S. naval base is too big to be so considered), or if found in a variety of places with *decoratus*, ecologically separate, or whatever. Information on any of these points could influence our decision. Only carefully documented collecting and field observation will determine the truth.

Specimens examined. Cuba, Oriente Province: UIMNH 44215 (type), U.S. Naval Base, Guantánamo, November, 1957, C. Grant; UIMNH 44216-31, 44233-38, MCZ 61230-31 (female paratypes), U.S. Naval Base, Guantánamo, January, 1958, Andrew Spielman; UIMNH 44240-44 (male paratypes), data same as preceding; USNM 81822-23, Boquerón. Questionably referred: MCZ 69438, 69440, U.S. Naval Base, Guantánamo.

Sphaerodactylus torrei Barbour

Sphaerodactylus torrei Barbour, 1914, Mem. Mus. Comp. Zool., Harvard, 44(2):260. Type locality, Santiago de Cuba, Oriente Province, Cuba; type specimen, MCZ 6916.

Definition. Dorsal scales small, granular, serried, swollen, erect (especially on sides where the appearance is papillate), and weakly to strongly imbricate; faint keeling present in a few specimens; dorsals, axilla to groin, 45-59; dorsal scales with few large hair-bearing scale organs (3 hairs) on posterior face of scale. Ventral scales (including those of throat and chest) smooth, flattened, acute to rounded and imbricate (axilla to groin, 29-39); midbody scales 68-82; scales of tail acute to rounded, smooth flattened, imbricate, enlarged in midventral line; fourth toe lamellae 8-15. Internasals 0-2, mode 1; upper labials to mid-eye, 3-6, mode 4. Escutcheon large, compact, roughly triangular and with little extension onto thighs (6-12 X 9-27). Habitus stout, snout relatively long and narrow; size large, to 38 mm snout-vent.

Female coloration: Ground color light tan or gray; dark crossbands (2-3 axilla to groin, 4-5 snout to groin) solid or lightened centrally but not with well defined dark edges, ocelli when present small and not dark edged; narrow light fringe around dark bands sometimes present. Head dark to just behind eyes, light areas outline loreal and snout lines, the latter being either complete to interocular dark area or shortened and not joining interocular area; wide head band present with ear centrally positioned; neck band without ocelli or with more than two very small ocelli, not prominently outlined in black. Dark bands typically end abruptly on underside of throat or continue completly across; they do not fade out or meet to form an extensive marbling; dark color on snout represented beneath by a small but distinct mental spot. Venter light, tail banded like body.

Male coloration: Unicolor gray to tan on body; head and tail yellow; venter tan.

Range. The south coast of Oriente Province, Cuba, from the city of Guantánamo to the vicinity of Cabo Cruz (Fig. 11). Barbour and Ramsden (1919:120) referred to a specimen of *torrei* from Cotorro, which is near La Habana. We have not seen the specimen (it was received by Ramsden and may be in a Cuban collection), but it was in all probability a well-patterned specimen of *intermedius*. The same statement applies also to a "*torrei*" from Camoa (Barbour and Ramsden, *op. cit.*:85).

Remarks. In assigning the southwestern Oriente three-banded geckos to *torrei* (instead of *decoratus*), we may be accused of being arbitrary or of constructing a flimsy and artificial taxonomic edifice. Certainly, without the three-banded population, *S. torrei* would stand as a grossly distinguishable form with but two body bands, and such may be eventually found to be the truth. However, we were led to our conclusion by the facts that (1) there are no unquestionable specimens of *decoratus* (*i.e.*, females) either to the east in the fairly well collected region of Santiago, or to the northeast, either of which might indicate a link with the known Cuban populations of *decoratus;* (2) as discussed below the three-banded specimens are similar in several respects (coloration and modality of

scalation) to other *torrei*, and (3) number of body bands is not necessarily species constant.

It is possible that *S. decoratus* and *S. torrei* (or parts of them) are both members of one species, as their ranges are largely allopatric. This is a possibility that we cannot deny with complete certainty. However, on the basis of presently known localities (imprecise though they may be) there is a slight amount of east-west overlap and apparent sympatry at the city of Guantánamo, in which area the two are eminently distinct. It is the western three-banded race which causes the most doubt. As we have defined it, *S. torrei* is distinguishable from *S. decoratus* by its solid body and neck banding, not lightened centrally or dark edged, and ocelli, when present, small, simple, and not dark-edged; and by the very simple throat patterns in which the head banding extends onto the throat but remains discrete and boldly contrasting, and does not fade out or meld into an irregular mottling. Other less precisely enumerable differences in habitus and in trends of scalation (*i.e.*, dorsal scales of *torrei* tend to be more erected and closely packed) appear to exist.

Sphaerodactylus torrei torrei Barbour

Definition. A subspecies of *S. torrei* characterized by having two dark body bands wider than the light interspaces, a high frequency of dorsal keeling in adults, a long median snout stripe extending from tip of snout to interocular dark area, and a high modal number of fourth toe lamellae.

Range. Along the south Oriente coast from the vicinity of Santiago de Cuba east at least to Playa Juraguá (Fig. 11).

Variation. In 22 specimens, dorsal scales, axilla to groin, 45-49, mean 52.6; ventrals, axilla to groin, 31-37, mean 35.3; midbody scales 68-83, mean 74.3; some degree of dorsal scale keeling occurs in 25 of 27 adults. Internasals 0-2, mode 1; upper labials (in series from each side) to mid-eye 4 (50), 5 (23), or 6 (1) (number of labial series in parentheses). Escutcheons 6-10 X 9-21.

Female coloration (Fig. 12): All patterned specimens (21) have all dark (black) bands wider than light interspaces, and median dark snout stripe joined with dark interocular areas. Dark bands of most adults hazily and irregularly hollowed, outlined by faint light fringe. Neck band continues across throat in most specimens, posterior head band broken ventrally in most, and band at eye level discontinuous across throat and ends abruptly; dark chin spot extends posteriorly to include first lower labial.

Male coloration: Gray to tan on body; head and tail yellow or yellowish.

Specimens examined. Oriente Province: AMNH 83594-96 (6 specimens), AMNH 94260 (2 specimens), AMNH 94261, AMNH 94263, 4 km N Santiago de Cuba; MCZ 6916 (type), MCZ 84370-71 (paratypes), MCZ 84372-74, MCZ 6917, MCZ 19771, AMNH 42546, AMNH 42583-90, UMMZ 90728-29, UMMZ 90631, Santiago de Cuba; UMMZ 90724 (2 specimens), Santiago de Cuba, Church of San Francisco; AMNH 17721, Siboney; AMNH 94262 (3 specimens), Playa Juraguá, 3.7 mi E Siboney.

Sphaerodactylus torrei ocujal, new subspecies

Holotype. USNM 138015, an adult female, collected at Ocujal, Oriente Province, Cuba, by J. D. Hardy, 31 August 1956.

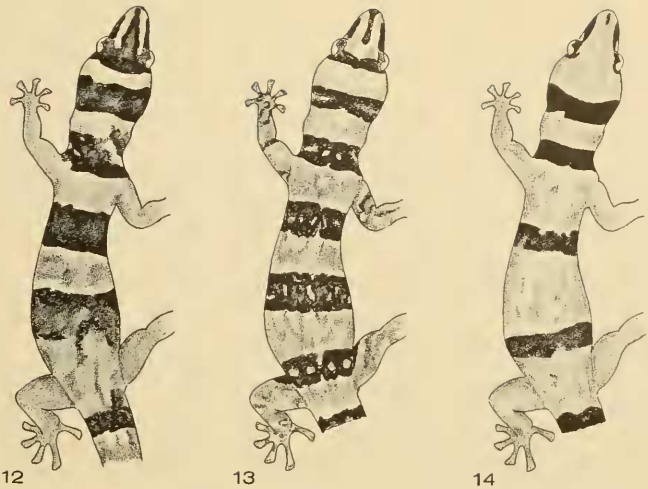
Paratypes. Cuba, Oriente Province: AMNH 32301, Belie, no collector, no date; USNM 138017, 5 mi N Cabo Cruz, J. D. Hardy, 6 September 1956; UMMZ 90727, 4 mi N Cabo Cruz, A. Vanderhorst, January, 1939; USNM 81827-28, Puerto Portillo, P. Bartsch, 29 August 1930; MCZ 42487, coast S of Pico Turquino, P. J. Darlington, June 1936; MCZ 50152, 84397, near Pico Turquino, J. Acuña, 10-19 June 1936; USNM 138016, 1 mi E Ocujal, J. D. Hardy, 31 August 1936; USNM 29759, Guamá, B. S. Bowdish, 2 January 1902.

Associated specimens. Cuba, Oriente Province: UMMZ 90725, Santiago de Cuba, La Socapa; UMMZ 90726, Santiago de Cuba, Morro Castle.

Definition. A subspecies of *S. torrei* characterized by having three dark bands only slightly broader than light interspaces between axilla and groin; numerous, very small, not dark-edged, ocelli in dark bands of adults; median dark snout line not extending to interocular dark area; male coloration spotted; dorsal keeling absent in most specimens.

Range. From the vicinity of Cabo Cruz east at least to Guamá and probably to the coast southeast of the city of Santiago de Cuba (Fig. 11).

Description of type (Fig. 13). An adult female with snout-vent length of 33 mm, tail missing. Dorsals, axilla to groin, 52; ventrals, axilla to groin, 35; midbody scales 73; fourth toe lamellae



Figs. 12-14. Fig. 12. *Sphaerodactylus torrei torrei*, female, dorsal view; MCZ 6916, holotype, Santiago de Cuba, Oriente Province, Cuba. Fig. 13. *S. t. ocujal*, female, dorsal view; USNM 138015, holotype, Ocujal, Oriente Province, Cuba. Fig. 14. *S. t. spielmani*, female, dorsal view; MCZ 61233, paratype, Guantánamo, Oriente Province, Cuba.

10; internasal 1; 4 supralabials to mid-eye. Dorsal scales granular (more so middorsally), only slightly imbricate, swollen but not erected, and keeled only in sacral region; gular, chest and ventral scales smooth.

Coloration: Median dark snout stripe extends to level with anterior border of orbits; loreal stripes present, dark band at level of eyes unbroken medially; posterior head band relatively narrow, about width of light interspace, hollowed centrally by light suffusion, and with ear centrally positioned. Neck bands and three body bands dark brown, approximately same width as light interspaces, suffused with lighter brown centrally, and bearing numerous small, not dark-edged, ocelli. Dorsal ground color brown, lighter at margins of dark bands. Ventrally a U-shaped dark spot is confined to mental, followed on either side by another dark spot occupying central half of first lower labial; dark band at eye level extends onto throat and broken medially in abrupt (not fading) termination; posterior head band continues across throat, neck band does not, and terminates abruptly, as do body bands, on ventrolateral surfaces; appearance of fading is given by central light suffusion.

Variation. Dorsals, axilla to groin (5 specimens), 48-54, mean 51.2; ventrals, axilla to groin (4 specimens), 32-36, mean 34.5; midbody scales (5 specimens) 73-79, mean 75.5; fourth toe lamellae 9-14, mode 13; internasals 1-2, mode 1; supralabials 3 (2 labial series) or 4 (20 labial series); escutcheons 7-9 X 9-12. Coloration of four adult female paratypes similar to that of type; median snout line of one (USNM 81828) touches interocular dark zone by virtue of thin spire-like extension, but is not broadly confluent therewith; second chin spots lacking in USNM 29759, but mental spot entirely covers mental and extends onto first labial. One specimen (MCZ 42487) has somewhat scrambled but still recognizable body pattern. Juvenile specimens have very solid bands and lack ocelli, as is characteristic of juveniles of other forms of this group. Extent of ventral banding described for type similar in other specimens, although neck band continuous across throat in one and eye-level band in another. Males are spotted with relatively small, dark brown spots; two specimens transitional from juvenile pattern to spotted condition, and faint but complete basic patterns agree in detail with female pattern described. One specimen (MCZ 84397) has unicolor head, and of two provisionally referred specimens one (UMMZ 90725) has only head spotted, body unicolor. These two specimens will be discussed below.

Sphaerodactylus torrei spielmani Grant

Sphaerodactylus spielmani Grant, 1958, Herpetologica 14(4):225. Type locality, Guantánamo, Oriente Province, Cuba, type specimen UMNH 44105.

Definition. A subspecies of *S. torrei* characterized by having dark transverse bands narrower (approximately half as wide) than the light interspaces, and only two between axilla and groin; median snout-stripe typically short, never joining interocular dark area; eye-level band reduced, not continuous across head in most specimens, males unicolor; dorsal keeling lacking in majority of specimens, and low modal number of fourth toe lamellae.

Range. Known only from the city of Guantánamo but assumed to meet and intergrade with *S. t. torrei* somewhere between Playa Juraguá and Guantánamo (Fig. 11). The species is not known from the U.S. Naval Base, as far as we know, and whether it ranges to the east of the city of Guantánamo is unknown.

Variation. In 50 specimens, dorsal scales, axilla to groin, 43-59, mean 53.7; ventrals, axilla to groin, 29-37, mean 33.3; midbody scales 68-79, mean 73.0; fourth toe lamellae 8-15, mode 10; internasals 0-1, mode 1; upper labials to mid-eye 3 (five labial series), 4 (121 series), 5 (98 series), 6 (6 series). Escutcheons 6-12 X 11-24. The largest specimen is a male that measures 38 mm snout-vent length.

Female coloration (Fig. 14): Females generally as diagnosed. Some have lightened centers to bands or irregular light spots within them; there may be tendency toward further reduction of body bands, as some specimens have one or more of these broken, reduced, or incomplete. About 88 percent have eye-level band incomplete across head, some specimens have ventral portion of band disjunct from dorsal portion, in some this leaves only narrowly circumorbital dark area. Roughly half of specimens have no first infralabial spot; some have this spot joined by narrow extension with ventral ends of eye-level band; many of those which have no first labial spot have slight anterior extension of eye-level band. Thus the loss of that spot appears to involve fusion with the eye-level band.

Males are unicolor tan to gray brown in their final adult coloration.

Comparisons. *Sphaerodactylus t. torrei* is distinguished from *ocujal* by the possession of two, rather than three, body bands, by having the median snout stripe confluent with the dark interocular region (Fig. 15), by lacking ocelli in the bands, by having unicolor rather than spotted males, and by having the mental spot fused with the first labial spot. *Sphaerodactylus t. spielmani* differs from *torrei* in having the dark bands much narrower than the light interspaces (rather than distinctly wider) and in having the median snout-stripe short and not connected with a dark interocular area (Fig. 15); in lacking keeling in most specimens *spielmani* differs modally from *torrei*, at least; it also differs from both *torrei* and *ocujal* in having a modal number of fourth toe lamellae of 10 rather than 13. *Sphaerodactylus t. ocujal* differs from both the other races in possession of three rather than two body bands. The reasons we have included it in *torrei* in the absence of obviously intergradient specimens have been stated in the discussion of the species. Additionally, we felt that our conviction of relationships of the forms should be expressed trinomially rather than by proposing another species for a region that has already had described from it a plethora of species.

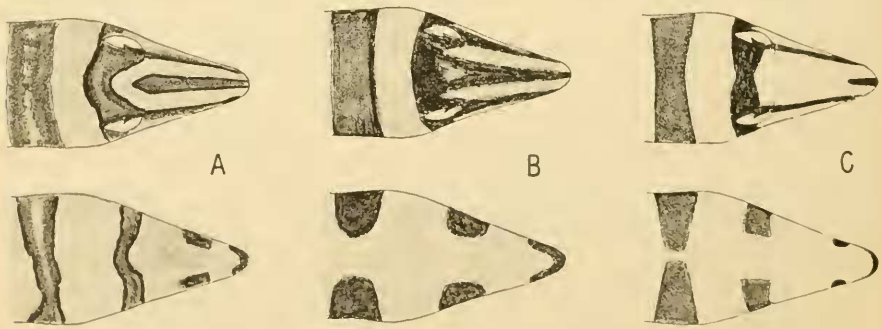


Fig. 15. Dorsal and ventral views of heads of three subspecies of *S. torrei*: A, *S. t. ocujal*, MCZ 42487; B, *S. t. torrei*, AMNH 42586; C, *S. t. spielmani*, UMNH 44212.

In some respects (shortened snout stripe, the modal presence of a separate first lower labial spot, and modal lack of keeling in both forms) *ocujal* and *spielmani* are more similar to one another than to *torrei*. The two male specimens provisionally referred to *ocujal* are of interest because of their proximity to Santiago de Cuba, the locality for many of the *torrei* examined. Both are from the mouth of the Bahía de Santiago. One of them lacks spotting except on the head, and it may be that this region is an area of intergradation between the two forms. The bay would not necessarily be an absolute barrier at its mouth (which is very narrow), because the region has evidently been in a state of geological flux and different channels have probably existed as mouths to the bay at different times in the relatively recent geological past. Therefore an area of intergradation *could* exist in a region encompassing both sides of the mouth of the Bahía de Santiago. Whether it does or not, only more specimens will demonstrate.

Specimens examined. Cuba, Oriente Province: UIMNH 44105 (type), 44106-45, 44152-213, MCZ 61232-33; BYU 17165-6 (paratypes), MCZ 59142-46, USNM 140270-73, Guantánamo.

Sphaerodactylus stejnegeri Cochran

Sphaerodactylus stejnegeri Cochran, 1931, Copeia, no. 3, p. 90. Type locality, San Michel, Dépt. du Nord, Haiti (here amended to St. Michel de l'Atalaye, Dépt. de l'Artibonite); type specimen, USNM 76640.

Definition. A *Sphaerodactylus* of the *decoratus* group characterized by having dorsal scales flattened to slightly swollen, smooth, rounded, and slightly imbricate; head granules relatively large and cobble-like, not small and tending toward conical; dorsals with few large hair-bearing organs on tip of scales; dorsals, axilla to groin, 41-52, mean 47.0; ventrals smooth, flattened, rounded, and imbricate (axilla to groin, 27-36; mean, 31.1); scales around midbody 53-65, mean 57.7; dorsal scales of tail smooth, flat-lying, rounded and imbricate; scales beneath tail smooth, rounded, imbricate and enlarged midventrally. Internasals 1-2, mode 1; upper labials to mid-eye 4 or 5 in one labial series; escutcheon relatively large, compact and with extensions well onto thighs (4-7 X 15-22; one specimen has an escutcheon width of only 7 scales). Habitus moderate to slender, snout moderate in length and breadth but sharply pointed; size moderate, to 31 mm snout-vent in males, 30 mm in females.

Female coloration (Fig. 16): Dorsal ground color light gray to gray-brown, irregularly spotted or mottled with brown; two solid black body bands, very narrow and widely spaced, and outlined with white margins; neck band solid black, somewhat wider than body bands, outlined in white, extending onto throat and usually ending ventrolaterally, but may extend completely across; tail banded with dark bands similar to those of body; head pattern simple and distinct: one relatively wide dark band anterior to ear joined broadly on each side by wide postocular dark stripe that continues anterior to eye as wide loreal stripe to tip of snout; venter light, cream to grayish.

Male coloration: Unicolor tan or yellowish tan above, venter as in females. (Coloration given here is from preserved specimens.)

Range (Fig. 17). As presently known, Haiti, from St. Michel de l'Atalaye west to St. Marc (Mertens, 1939:42), thence south to the Cul de Sac Plain (it is not known from the Dominican Valle de Neiba). The record from "southwestern Haiti" (Cochran, 1941:112) cannot be taken too precisely; the specimen was originally cited as being from "Haiti" (Cochran, 1924:3).

Remarks. We have amended the type locality because there appears to be no San Michel in the Département du Nord, and because the collectors of the type, A. J. Poole and W. M. Perrygo, visited St. Michel de l'Atalaye in December of 1928 (Wetmore and Swales, 1931:36) when the type was collected.

Fig. 16. *S. stejnegeri*, female, dorsal view; MCZ 63173. Eaux Gaillées. Dépt. de l'Ouest. Haiti.

Fig. 17. Map of Haiti. Solid symbols indicate localities whence specimens of *S. stejnegeri* have been examined, and the hatched area indicates the conjectural range of the species. The northeastern extension of the hatching includes the type locality whence we have not examined material.

Specimens examined. Haiti: Dépt. de l'Artibonite: MCZ 59478-87, bridge over Rivière de l'Artibonite, St. Marc Road; **Dépt. de l'Ouest:** MCZ 13481, Thomazeau; MCZ 52158-62, Hatte Lathan, Cul-de-Sac Plain; MCZ 59488-94, 63172-73, 84353, YPB 3089-90, Eaux Gaillées; MCZ 13442, Coutard.

Sphaerodactylus intermedius Barbour and Ramsden

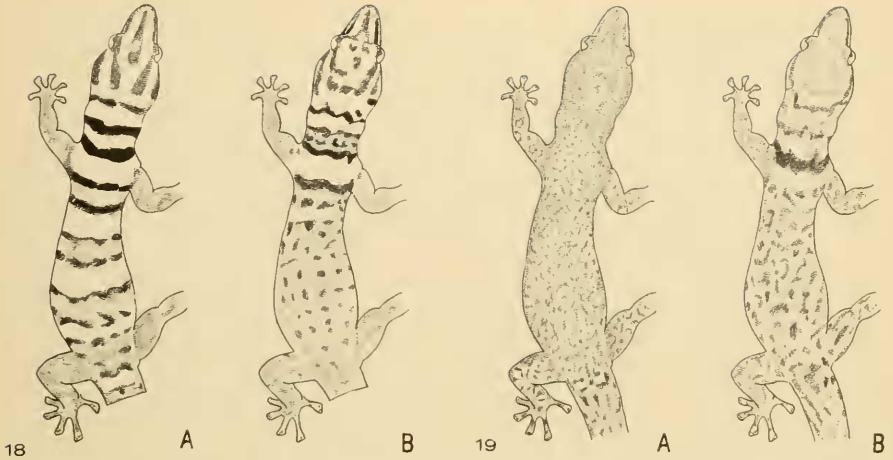
Sphaerodactylus intermedius Barbour and Ramsden, 1919, Mem. Mus. Comp. Zool., 47:211. Type locality, Sierra de Hato Nuevo between Hato Nuevo and Sabanilla de la Palma, Matanzas Province, Cuba; type specimen, MCZ 12305. *Sphaerodactylus decoratus drapetiscus*, Schwartz, 1958, Proc. Biol. Soc. Wash., 71:29. Type locality, 2 mi E Playa de Guanabo, Cueva de Rincón de Guanabo, Habana Province, Cuba; type specimen, AMNH 77759.

Definition. A *Sphaerodactylus* of the *decoratus* group having the dorsal scales granular and juxtaposed to swollen, rounded and slightly imbricate but not prominently erected and papillate; weak keeling present in most specimens. Dorsal scales with few large hair-bearing scale organs on posterior face of scales, dorsals, axilla to groin, 49-62; ventrals 31-44; midbody scales 65-77. Dorsal scales of tail smooth, flat-lying; ventral scales of tail smooth, enlarged, but apparently not prominently so in midventral line. Internasals 0-2, mode 1; upper labials to mid-eye 4 or 5, mode 4; escutcheon large, compact, roughly triangular and with virtually no extension onto thighs, 6-8 X 8-11. Habitus moderate, snout elongate, size large, to 35 mm snout-vent.

Female coloration (Fig. 18): Head band and facial markings united to produce dark head markings that end just behind ear; two dark-edged light postocular stripes, one (inferior) that proceeds diagonally onto ventrolateral surface of throat, fading out on a level with ear, and one (superior) proceeds diagonally upwards and over temporal area, and at least in its "basic" manifestation turns medially and joins its mate on opposite side, forming a U-shaped light cephalic figure; loreal and median snout stripes present, latter forked posteriorly before joining interocular area; collar present, heavily dark-edged and light-centered, but not ocellate; body bands 3 or 4 (a 4/5 band count is found in one specimen), sometimes broken up on posterior part of body or faint in young (or long-preserved?) specimens, prominently dark-edged and somewhat sinuous. Coloration in life: dorsal ground color yellowish gray, brightest on neck and shoulders; ground color of dorsum of head pale yellowish gray; collar black-edged with yellowish gray center which has a few scattered yellow dots just posterior to the anterior black edge; body bands black-edged becoming gray posteriorly, center of bands always with a few scattered yellow dots; dorsa of limbs yellowish gray—flecked and mottled with tan; venter grayish, with gray flecking on infralabials and throat.

Males heavily spotted with very dark brown on a light yellowish-tan ground color; head distinctly more yellowish than body; ground color of tail bright yellow (notes based on coloration of type and paratypes of *drapetiscus*: Schwartz, 1958).

Range. Known from the northern portions of Habana and Matanzas province (probable records from Cotorro and Camoa have been noted under the range of *torrei*), and from the southwestern coast of Oriente Province near Cabo



Figs. 18-19. Fig. 18. *Sphaerodactylus intermedius*, dorsal views of two females: A, AMNH 77763, 2 mi E Playa de Guanabo, Cueva de Rincón de Guanabo, Habana Province, Cuba; B, AMNH 94550, 10.5 mi NE Matanzas, Matanzas Province, Cuba. Fig. 19. *S. ruibali*, dorsal views: A, ASFS V6252, male, east side, Guantánamo Bay, U. S. Naval Base, Oriente Province, Cuba; B, female, UMMZ 110181, U. S. Naval Base, Oriente Province, Cuba.

Cruz (Fig. 6). The records from the latter area may well represent a distinct population.

Remarks. The type and paratype of *intermedius* have a very obscure body pattern but a bold neck and head pattern. Upon discovering that *S. cinereus* changes from a boldly banded juvenile ("*elegans*") to the more uniformly colored adult, Barbour (1923) concluded that *intermedius* had been based only on a transitional stage of this metachrosis and was therefore a synonym of *cinereus*, where the name remained hidden until the present study. *Sphaerodactylus cinereus* in the banded phase does not have the characteristic head pattern of *intermedius* but has a simpler one similar to that of *S. decoratus*. There is no doubt that *intermedius* is a close relative of *decoratus* (and other members of the group); but because of its radically different head pattern along with other significant pattern differences we have accorded it species status, which we have little doubt that it deserves. Of note are two specimens, MCZ 8510 from Cabo Cruz and USNM 81670 from Río Puerco, both of which are near the extreme southwestern tip of Oriente Province. (One of these specimens (MCZ 8510) is figured in dorsal aspect by Barbour and Ramsden (1919:Plate 2, Fig. 1), although it is not the type of *S. torrei*, as stated there.) We consider both to represent *S. intermedius*. They are old and faded but are banded and possess the distinctive head pattern of *intermedius*, including the double postocular stripes which are but faintly visible. Due to their somewhat distinctive patterns it is probable that they represent another race of the species, but we are reluctant to propose a new name because of the difficulty of being sure what features are due to fading and poor preservation, and what are natural. An additional difficulty is the possibility that *intermedius* and *ruibali* are derivative forms as evidenced by some similarities in their patterns (Fig. 20). In such a case the population represented by the southwestern Oriente specimens might be most significant and should not be described until its variation can be sufficently known.

Specimens examined. Cuba: Matanzas Province: MCZ 12305, 13726 (type and paratype of *intermedius*), Sierra de Hato Nuevo between Hato Nuevo (Martí) and Sabanilla de la Palma; UMMZ 78486, ANSP 16359 (paratype of *drapetiscus*), Matanzas; AMNH 94550, 10.5 mi NE Matanzas; **Habana Province:** AMNH 77759-63, 77765, 81367-71 (type and paratypes of *drapetiscus*), AMNH 94264, 2 mi E Playa de Guanabo, Cueva de Rincón de Guanabo; **Oriente Province:** MCZ 8510, Cabo Cruz; USNM 81670, Río Puerco.

Sphaerodactylus ruibali Grant

Sphaerodactylus ruibali Grant, 1959, Herpetologica, 15(1):53. Type locality, U.S. Naval Base, Guantánamo, Oriente, Cuba, type specimen UMNH 44246.

Definition. Dorsal scales small, obtuse to rounded, only slightly swollen, smooth and moderately but uniformly imbricate; dorsals, axilla to groin, 42-60, mean 49.5; few large hair-bearing organs (3 hairs) on posterior tip of dorsal scales; ventral scales smooth, flattened, rounded imbricate; axilla to groin, 30-41, mean 34.8; midbody scales 69-82, mean 75.2. Fourth toe lamellae 6-11, mode 10; upper labials to mid-eye, 3-5, mode 4; one internasal in all specimens. Escutcheon in fully adult specimens with large central area and slender extensions length of thighs, escutcheon scales not infrequently somewhat pigmented (dimensions 5-10 X 19-28). Habitus moderate, snout relatively short and broad, size moderate, to 32 mm snout-vent.

Female coloration (Fig. 19): Dark loreal stripe continues as inferior postocular stripe to level of ear where it meets with dark transverse head stripe that passes behind ear; superior postocular stripes (not always present) proceed for short distance on top of head and stop before meeting transverse head stripe. Pair of dark transverse stripes on neck appear to be cognates of neck stripe in other members of the *decoratus* group; no median snout stripe or interocular dark area present. Body mottled with dark brown irregular markings, which sometimes tend to form irregular ocelli, on tan or light brown ground color. Sometimes there are indications of a transverse dark stripe on anterior body just posterior to axilla; tail dull yellow with some brown mottlings or reticulation. Venter light gray; underside of tail dull yellow. Iris color light gray or gray in life.

Male coloration (Fig. 19): Male loses head and neck banding of female-juvenile pattern with maturity. Head becomes nearly uniform yellow-brown; body color becomes yellow-brown to gray with fine brown specklings or vermiculations. In life, venter is light gray, tail yellow above and below with fine dark mottling above. (Colors from field notes on specimens in life.)

Range. Although not always so stipulated, the naval base records are presumed to be from the east side of the bay (this is known to be true for the MCZ specimens). The known range therefore extends from the east side of the Bahía de Guantánamo to the Río Yateras (Fig. 11), the mouth of which is roughly ten miles east of the bay.

Remarks. The flattened and more imbricate dorsal scales of *ruibali* distinguish it from other members of the *decoratus group.* This scale type, however, is not very far removed from that shown by members of the group and probably represents an early stage in the development of the flattened, more strongly imbricate scales of some species in the genus. The simplified pattern remnants of *ruibali* are reminiscent of those found in *intermedius*: the postocular pattern, the transverse head pattern extending to behind the ear instead of ending just behind the eyes, and the prominence of the neck and anterior body pattern versus that of the rest of the body (very similar to some specimens of female *intermedius* in which the body pattern is much broken up but the head, neck, and scapular patterns are very bold). It is possible that *ruibali* may be an *intermedius* derivative in eastern Oriente.

Several specimens of *S. ruibali* were collected by the senior author at a locality where *S. decoratus* was also taken. However, *ruibali* was found in a more exposed and drier area than were the *decoratus* which were taken in a well-watered nursery.

Specimens examined. Cuba, Oriente Province: UMNH 44246 (type), 44247-49 (paratypes), MCZ 67380-81, 68733-35, 68931-35, 69436-37, 69439, 69442, UMMZ 110181, U.S. Naval Base, Guantánamo; ASFS V6252-55, east side, Guantánamo Bay, U.S. Naval Base; USNM 78921-22, Río Yateras.

HABITAT

Sphaerodactylus decoratus: In the Bahamas some differences in habitat preferences were observed for *decoratus* on the various islands. On South Bimini *flavicaudus* was found almost exclusively in a beach habitat of low dunes where specimens were taken in litter from *Thrinax* palms. On Andros our experience was less extensive but specimens were also found in beach areas or immediately behind beaches and in association with *Cocos* and *Sabal* trash. On Eleuthera specimens of *S. d. atessares* were also most easily collected in sandy beach areas, par-

ticularly in piles of *Cocos* trash or around bases of *Thrinax*. However, the species is apparently more widespread (but rarer) in other situations; one was taken in arid scrub on the southern portion of the island and two others, although taken in a stand of *Thrinax*, were in a coastal limestone scrub, which is not a beach habitat. On Andros, Bimini and Eleuthera *S. notatus* was more widespread than *S. decoratus* and was found both in beach and interior situations. On Great Exuma *S. d. decoratus* was apparently more widespread and was often seen in the interior of the island, usually in piles of rocks. It was most easily collected in the beach situation where palm trash was available. This is in contrast to the aforementioned islands where, despite intensive collecting in interior localities, virtually no specimens were seen. On Cat Island two specimens were taken at night near a light on a plaster-walled house. On Long Island most specimens were taken in a solution hole planted in bananas but others were taken under rocks in shady areas.

Our only experience with Cuban *decoratus* was with *S. d. strategus*, which was collected in a very xeric region but found most abundantly in the artificially moist microhabitat of a well-watered nursery on the U.S. Naval Base. Specimens were taken by moving flowerpots and many more were seen than were collected. Also collected in the same situation were *Amphisbaena cubana* and *Eleutherodactylus atkinsi*. Only one specimen was taken in a more xeric situation along the coast. As to the northern habitat of the races, little or nothing is available. However, we know that the country is generally more mesic in northern Oriente, and Grant (1960) stated that the Banes and Preston area was "forested and humid," which we may presume forms the habitat for *S. d. granti*. The types of *lissodesmus* were taken in a rotten log in forest. The Sierra de Cubitas is in general a mesic area.

Sphaerodactylus alayoi: No habitat notes are available for this species but if the specimens came from the U.S. Naval Base, they were probably taken in xeric surroundings.

Sphaerodactylus torrei: Of the specimens of the nominate race collected by the junior author and company, two were taken in a motel room; three were found in a stone wall in relatively mesic but open surroundings, and those from Playa Juraguá in coastal arid forest. Male specimens of *torrei* that we have included in the race *ocujal* were reported by Cooper (1958) as coming from a coastal sea-grape (*Coccoloba*) situation, where they were taken in "rocks, dried leaves, and other plant debris."

Sphaerodactylus intermedius: This type and paratype of this species were described by Barbour (1921) as having been collected "under loose stones on a dry, rather scrubby, hillside pasture." Schwartz (1958, on the type series of *drapetiscus*) described taking the species "under rocks on the ground" at the base of limestone cliffs; the situation was in "typical tropical deciduous woods with scattered palms." The specimen from northeast of Matanzas was taken in leafy trash at the base of a small tree on a cleared beach.

Sphaerodactylus ruibali: The type series of this form was reported as having been taken in grassy hills at about 300 feet elevation (Grant, 1959b). The specimens collected by the senior author were found adjacent to the nursery described above for *S. d. strategus*. However, the *ruibali* were taken in an exposed area where they were found under scattered rocks and in a rather thin and spotty covering of leaves; none was seen in the moist nursery.

Sphaerodactylus stejnegeri: Although we have had no first hand experience with this species, it apparently is capable of enduring a variety of habitats. The "bridge over the Rivière de l'Artibonite," whence we examined specimens, is a mesic situation, and the Cul-de-Sac is in general dry and desert-like, but the species may occur in oasis situations there. Seven specimens from Eaux Gaillées (MCZ 59488-94) have as part of their collecting data that they were taken on a large tree. Mertens (1939:42) noted that the only *S. stejnegeri* he collected was on the wall of a house in the late afternoon.

CONCLUSIONS

The granular scaled forms have been regarded as more primitive members of the genus (Barbour, 1921:218; King, 1962:42), and probably correctly so. The evidence seems to indicate that forms with more specialized scale types have arisen on different occasions from the granular scaled ones. Thus, of the Cuban members of the *decoratus* complex, *S. torrei* shows a dis-

tinct trend toward flattening and imbrication of the scales. This, coupled with the striking similarity in patterns of *S. stejnegeri* to *S. torrei*, leads us to believe the two to be derivative forms. This is borne out in the scalation of *stejnegeri* which is a degree further advanced beyond *torrei* in flattening and imbrication of body scales (it may be further noted that of the Cuban forms, *torrei* possesses less keeling than the others and that keeling is lacking in *stejnegeri*). The distributional picture supports this conclusion. *S. torrei* is apparently a wholly eastern Cuban species and *S. stejnegeri* is a wholly western Hispaniolan one, and perhaps primarily a northwestern one at that (although it reaches the Cul-de-Sac Plain, it has apparently not exploited this natural channel into the Dominican Republic).

Although we are less certain about the affinities of *S. ruibali*, on the basis of head patterns (Fig. 20) its relationships may well lie with *S. intermedius*. If such is the case, once again we see a progression toward flattening and imbrication of the dorsal scales. At the same time there can be little doubt that *S. intermedius* and *S. decoratus* are derivative forms; it is probable that the former partakes of a relict distribution, as it is found in western Cuba and southwestern Oriente. Of note is the occurrence of other relict or apparently relict forms in the same general region of Oriente. Thus *Leiocephalus raviceps* has two races in southeastern and eastern Oriente and another apparently disjunct in Matanzas Province (Schwartz, 1960); and *Cricosaura typica* is a relict Cuban xantusiid known only from extreme southwestern Oriente (Savage, 1964).

Sphaerodactylus torrei is presumed to have arisen as an isolate on the southern coastal slopes of the Sierra Maestra. If we have interpreted the three-banded subspecies *ocujal* correctly, the close affinities of *torrei* with *decoratus* are certain. *S. t. ocujal* is the most distal race from the present area of contact between *S. decoratus* and *S. torrei*, and, unless contact with northern (as opposed to eastern) *decoratus* existed around the western end of the Sierra Maestra, is the most isolated of the races of *torrei* from the presumed ancestral form. This relative isolation may account for the retention of the more primitive color pattern (greater number of body bands). Present records indicate that the primary distribution of *S. decoratus* in Cuba is the north of Oriente Province. It probably occurs to the east of the Bahía de Guantánamo and is possibly continuous peripherally with the north coast populations around Cabo Maisí. *Sphaerodactylus d. lissodesmus* is the westernmost representative of the species and may be endemic to the Sierra de Cubitas. *Sphaerodactylus alayoi* is certainly a close relative of *S. decoratus*, but so little is known of its

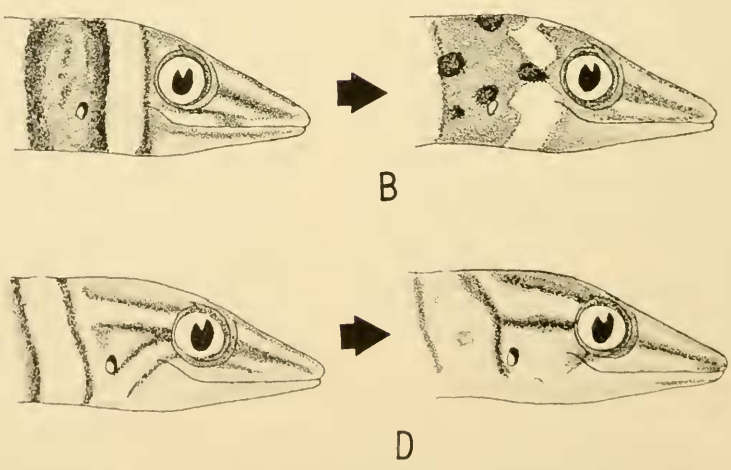


Fig. 20. Lateral views of heads of four geckos to show hypothetical evolution of pattern from generalized *decoratus*-type head pattern through *intermedius* to *ruibali*: A. *S. decoratus granti* (BYU 17232); B. *S. decoratus* subsp. (MCZ 42281), C, *S. intermedius* (AMNH 81367); D, *S. ruibali* (MCZ 67380). The Cat Island specimen of *S. decoratus* (B) shows a pattern variant which demonstrates the possible method of origin of the *intermedius-ruibali* head pattern.

distribution that no explanation of its origin can be hazarded (and for that matter, its status must also remain in slight doubt). The presumptive *intermedius-ruibali* relationship may reflect an older subgroup of this complex, as indicated by (1) a high degree of divergence, and (2) a relict distributional pattern.

Sphaerodactylus decoratus as here defined includes both Bahaman and Cuban races. Some might prefer that these two geographical groups be regarded as separate species. However, we believe that on the basis of geographical proximity and similarity of coloration and scalation of the two that we have made the choice that best expresses their relationships. The diversity of *decoratus* in the Bahamas themselves, less in degree than that which has occurred in the group in Cuba, is attributable to the recency of the present Bahaman land configuration and probably also to its variability. The herpetofauna of the Bahamas north of the Crooked Island Passage is primarily Cuban in origin and the degree of endemism is not generally great. It has been postulated that the Bahamas were colonized from Cuba by dispersal across water rather than by direct connection with Cuba (Clench, 1938; Rabb and Hayden, 1957), as there is presumed to have been no continuous land connection between the two areas. *Sphaerodactylus decoratus* is absent from the Little Bahama Bank and the islands south of the Crooked Island Passage. Both of these divisions are occasions for distinct (but not absolute) faunal breaks in the Bahamas. Rum Cay is separated from the Great Bahama Bank by deep water (about 1500 fathoms) and is the only island to which *S. decoratus* has spread beyond the Great Bank.

Puerto Rico has no members of this group, nor apparently does Jamaica (we have not had first-hand experience with *S. oxyrrhinus*, but it does not seem to pertain to the *decoratus* group). The group is also not represented in the Lesser Antilles; with the possible exception of *S. cinereus* (see below) it is not represented on Hispaniola except by *S. stejnegeri*.

Sphaerodactylus cinereus has not been considered a member of the *decoratus* complex in this study because of its differences in coloration, lack of sexual dichromatism, and scalation (of all the forms we have seen it probably comes closest to having truly granular scales). If in the future it should be considered to belong to the group, its distribution fits well with the concept of a Cuban origin of the complex. It is widespread on Cuba (but uncommon in Oriente Province) but restricted to western Hispanola, although in contrast to the similarly ranging *torrei-stejnegeri* pair, differentation between the populations of the two islands appears to be slight in this species.

Thus, the distributional picture presented by the *decoratus* group of sphaerodactyls is one of a principally Cuban radiation in which limited dispersal to nearby islands and island groups has occurred. The great diversity of forms in Cuba indicates a long history of the group there. That diversification has been greatest in eastern Cuba is perhaps explained by the physiographic and ecological complexity of this region.

Cuba is generally well represented by *Sphaerodactylus* and has more (and more diverse) species than any other West Indian island, including members of the *scaber* group characterized by large dorsal scales and a middorsal zone of granules, and *S. notatus*, which belongs to a loosely defined assemblage including forms (such as *S. difficilis* and *S. inaguae* and perhaps the Puerto Rican forms) having uniformly flattened, keeled and comparatively large dorsal scales. *Sphaerodactylus ramsdeni*, a local adaptation to the montane forest gecko niche, is probably derived from one of the other "groups" on the island. *S. argus* of Jamaican origins shows a restricted but apparently natural distribution in Cuba and is probably a comparatively recent arrival.

LITERATURE CITED

Barbour, T. 1914. A contribution to the zoögeography of the West Indies, with especial reference to amphibians and reptiles. Mem. Mus. Comp. Zool., 44(2):207-359.

———. 1921. *Sphaerodactylus*. Mem. Mus. Comp. Zool., 47(3):218-278.

——— and C. T. Ramsden. 1919. The herpetology of Cuba. Mem. Mus. Comp. Zool., 47(2):71-213.

Clench, W. J. 1938. Origin of the land and freshwater mollusk fauna of the Bahamas, with a list of species occurring on Cat and Little San Salvador Islands. Bull. Mus. Comp. Zool. 80(14):481-541.

Cochran, D. M. 1924. Notes on the herpetological collections made by Dr. W. L. Abbott on the island of Haiti. Proc. U. S. Nat. Mus., 66(6):1-15.

———. 1934. Herpetological collections from the West Indies made by Dr. Paul Bartsch under the Walter Rathbone Bacon Scholarship, 1928-1930. Smithsonian Misc. Coll., 92(7):1-48.

———. 1941. The herpetology of Hispaniola. Bull. U. S. Nat. Mus., 177:a-vii, 1-398.

Cooper, J. E. 1958. Ecological notes on some Cuban lizards. Herpetologica, 14(1):53-54.

Grant, C. 1937. Herpetological notes with new species from the American and British Virgin Islands, 1936. J. Dep. Agr. Puerto Rico, 21(4):503-522.

———. 1956. The status of *Sphaerodactylus gibbus*. Herpetologica, 12(3):247-248.

———. 1958. A new gekkonid lizard (*Sphaerodactylus*) from Cuba. Herpetologica, 14(4):225-227.

———. 1959a. A new *Sphaerodactylus* from Guantanamo, Cuba. Herpetologica, 15(1):49-53.

———. 1959b. Another new *Sphaerodactylus* from Guantanamo, Cuba. Herpetologica, 15(1):53.

———. 1960. Differences in shade of some reptiles from the north and south coasts of Oriente, Cuba. Herpetologica, 16(3):174.

Hecht, M. K. 1954. The comparison of recent and fossil amphibian, reptilian, and mammalian faunas in the Bahamas. Year Book Amer. Phil. Soc., pp. 133-135.

King, W. 1962. Systematics of Lesser Antillean lizards of the genus *Sphaerodactylus*. Bull. Florida State Mus., 7(1):1-52.

Mertens, R. 1939. Herpetologische Ergebnisse einer Reise nach der Insel Hispaniola, Westindien. Abh. senckenberg. naturf. Ges., 449:1-84

Rabb, G. B. and E. B. Hayden. 1959. The Van Voast-American Museum of Natural History Bahama Islands Expedition record of the expedition and general features of the islands. Amer. Mus. Novitates, 1836:1-53.

Savage, J. M. 1964. Studies on the lizard family Xantusiidae. V. *Cricosaura typica* Gundlach and Peters. Copeia no. 3:536-542.

Schwartz, A. 1958. A new gecko of the *Sphaerodactylus decoratus* group from Cuba. Proc. Biol. Soc. Washington, 71:27-36.

———. 1960. Variation in the Cuban lizard *Leiocephalus raviceps* Cope. Proc. Biol. Soc. Washington, 75:67-82.

Thomas, R. and A. Schwartz. 1966. *Sphaerodactylus* (Gekkonidae) in the Greater Puerto Rico region. Bull. Florida State Mus., 10(6):193-260.

Wetmore, A. and B. H. Swales. 1931. The birds of Haiti and the Dominican Republic. Bull. U. S. Nat. Mus., 155:1-483.